TECHNICIAN FILE COPY

INSTRUCTION BOOK

MODEL 1140-A

9305

TECHNICIAN FILE COPY

NULL DETECTOR – AMPLIFIER

FREED TRANSFORMER CO. INC.

INSTRUMENT DIVISION

INSTRUCTION MANUAL

FREED TRANSFORMER CO., INC.
1718 WEIRFIELD ST., BROOKLYN (RIDGEWOOD) 27, N. Y.

INSTRUCTION BOOK

MODEL 1140-A

9305

TECHNICIAN FILE COPY

NULL DETECTOR – AMPLIFIER

FEED TRANSFORMER CO. INC.

INSTRUMENT DIVISION

FREED MODEL 1140A
NULL DETECTOR AMPLIFIER

USES

THE TYPE 1140A NULL DETECTOR IS A SENSITIVE NULL INDICATOR FOR AC BRIDGE MEASUREMENTS, PROVIDING VISUAL NULL INDICATIONS OR AURAL NULL INDICATIONS WHEN USED IN CONJUNCTION WITH HEADPHONES. THE UNIT MAY ALSO BE USED AS A HIGH GAIN AMPLIFIER FOR GENERAL LABORATORY WORK.

DESCRIPTION

FUNCTIONALLY, THE INSTRUMENT CONSISTS OF A HIGH GAIN LINEAR AMPLIFIER WITH A 30 DB INPUT ATTENUATOR IN ADDITION TO A VARIABLE GAIN CONTROL. A FOUR INCH PANEL METER SERVES AS THE VISUAL NULL INDICATOR. A FUNCTION SWITCH IS PROVIDED SO THAT THE AMPLIFIER OUTPUT STAGE MAY BE OPERATED AS A LINEAR AMPLIFIER FOR GENERAL LABORATORY WORK, OR AS A LOGARITHMIC AMPLIFIER FOR NULL DETECTOR USE. IN THE LOG POSITION OF THE FUNCTION SWITCH THE NULL DETECTOR IS APPROXIMATELY LOGARITHMIC OVER A 40 DB RANGE. IN THE LIN POSITION THE NULL DETECTOR MAY BE USED AS AN OUTPUT MONITOR.

RESONANT CIRCUITS TUNED TO 60, 400 AND 1000 CYCLES LIMIT THE AMPLIFIER TRANSMISSION CHARACTERISTICS TO THE THREE AUDIO FREQUENCIES MOST COMMONLY USED FOR BRIDGE MEASUREMENTS. THIS FEATURE, CONTROLLED BY A FRONT PANEL SWITCH, PERMITS THE DISCRIMINATION OF FREQUENCIES OUTSIDE THE PASS BAND, RESULTING IN THE ELIMINATION OF HARMONICS AND OVERALL NOISE. A JACK IS PROVIDED ON THE FRONT PANEL OF THE INSTRUMENT SO THAT AN EXTERNAL FILTER MAY BE USED IF SELECTIVITY AT SOME OTHER FREQUNCY IS DESIRED.

IN THE "OUT" POSITION OF THE FUNCTION SWITCH NO FILTERS ARE IN THE CIRCUIT AND THE UNIT MAY BE USED AS A NON-SELECTIVE AMPLIFIER.

THE INPUT AND OUTPUT CIRCUITS ARE ISOLATED BY BLOCKING CAPACITORS.

SPECIFICATIONS

Use Pot. across the 200 Ω to obtain 100 μ V. signal

INPUT IMPEDANCE - EQUIVALENT TO ONE MEGOHM RESISTANCE IN PARALLEL WITH 20 μμF CAPACITANCE.

GAIN - 98 DB AT 1 KC WITH A ONE MEGOHM LOAD.

FREQUENCY RESPONSE - SEE CURVE.

NULL DETECTOR SENSITIVITY - AT 1 KC 100 μVOLTS WILL GIVE A 15% METER DEFLECTION WITH THE FUNCTION SWITCH IN THE "LOG" POSITION; 30% WITH THE FUNCTION SWITCH IN THE "LIN" POSITION.

LOG - set level at 40 - deflects 6 div.

LIN - " " " " - deflects 12 div.

OPERATING PROCEDURE

THE INSTRUMENT IS READY TO OPERATE AS RECEIVED. PLUG THE INSTRUMENT INTO THE AC POWER LINE [105 TO 125 VOLTS, 50 TO 60 CYCLES] AND TURN ON THE ON-OFF SWITCH. A PILOT LIGHT IS PROVIDED TO INDICATE WHEN POWER IS ON.

NULL DETECTOR

TO USE THE INSTRUMENT AS A NULL DETECTOR CONNECT BRIDGE OR OTHER SOURCE TO INPUT TERMINALS. FOR COMPLETE SHIELDING, A SHIELDED PLUG AND INPUT CABLE SHOULD BE USED. SET THE FUNCTION SWITCH TO THE "LOG" OR "LIN" POSITION. IN THE "LOG" POSITION THE RESPONSE OF THE METER CIRUIT IS APPROXIMATELY LOGARITHMIC OVER A 40 DB VOLTAGE RANGE. IF A LINEAR METER INDICATION IS DESIRED THE FUNCTION SWITCH SHOULD BE IN THE "LIN" POSITION. FOR MOST BRIDGE APPLICATIONS THE "LOG" DETECTOR SHOULD BE USED, BUT IF SMALL CHANGES IN LARGE UNBALANCING POTENTIALS ARE TO BE NOTED THE "LIN" DETECTOR SHOULD BE USED. I.E. IF THE BRIDGE IS FAR OFF BALANCE AND IT IS DESIRED TO FIND THE DIRECTION OF BRIDGE BALANCE. TURN THE GAIN CONTROL TO ZERO AND ADJUST THE "SCALE ADJUST" OF THE INSTRUMENT UNTIL THE METER REACHES FULL SCALE IN THE IN THE DIRECTION OF THE ARROW ON THE SCALE. THEN TURN THE GAIN CONTROL UNTIL THE METER GIVES THE DESIRED INDICATION. FOR LARGE INPUT SIGNALS THE "ATTENUATOR" SHOULD BE IN THE -30 DB POSITION, TO PREVENT OVERLOADING OF THE IMPUT STAGE.

THE ROTARY SWITCH LABELED "FILTER" INSERTS SELECTIVE CIRCUITS TUNED TO 60, 400 AND 1000 CYCLES INTO THE AMPLIFIERCIRCUIT. IN THE "EXT" POSITION A TUNED LC CIRCUIT WITH AN IMPEDANCE OF 27,000 OHMS MAY BE CONNECTED TO THE FILTER JACK. [USING AN AMPHENOL TYPE 80MC-2M JACK]. IN THE OUT POSITION OF THE FILTER SWITCH, THE NULL DETECTOR HAS A WIDE FREQUENCY RESPONSE.

TO USE THE INSTRUMENT AS AN AMPLIFIER OR AURAL NULL INDICATOR, TURN THE FUNCTION SWITCH TO THE "AMP" POSITION. IN THIS POSITION OF THE FUNCTION SWITCH THE METERING CIRCUIT IS DISCONNECTED AND THE AMPLIFIER OUTPUT MAY BE USED IN CONJUNCTION WITH HIGH IMPEDANCE EARPHONES.

SERVICING

THE SERVICING OF THIS INSTRUMENT BY THE USER IS NOT RECOMMENDED. IF TUBE REPLACEMENT BECOMES NECESSARY, CARE SHOULD BE TAKEN TO AVOID USING MICROPHONIC TUBES OR TUBES THAT HAVE HIGH LEAKAGE BETWEEN FILAMENT AND CATHODE. TO CHECK, SHORT THE INPUT TERMINALS AND WITH THE GAIN SETTING AT MAXIMUM NOTE THE METER DEFLECTION. IF METER IS DEFLECTED OTHER TUBES SHOULD BE TRIED. SINCE ANY NOISE IN THE INPUT STAGE IS AMPLIFIED IN THE FOLLOWING STAGES IT IS EXTREMELY IMPORTANT THAT THIS TUBE IS CHOSEN CAREFULLY. INTERCHANGING OF THE AMPLIFIER TUBES WILL OFTEN BE SUFFICIENT TO DECREASE THE NOISE LEVEL FOR PROPER OPERATION.

OUTPUT IMPEDANCE - APPROXIMATELY 50,000 OHMS.

OUTPUT VOLTAGE - 40 VOLTS UNDISTORTED INTO ONE MEGOHM LOAD; 10 VOLTS INTO 10,000 OHM LOAD.

HUM AND NOISE LEVEL - WITH THE SELECTIVE FILTERS OUT, LESS THAN 60 µVOLTS REFERRED TO THE INPUT; WITH THE 1000 CYCLE SELECTIVE FILTER, LESS THAN 5 µVOLTS. [MEASURED WITH IMPUT TERMINALS SHORTED, GAIN SETTING MAXIMUM.]

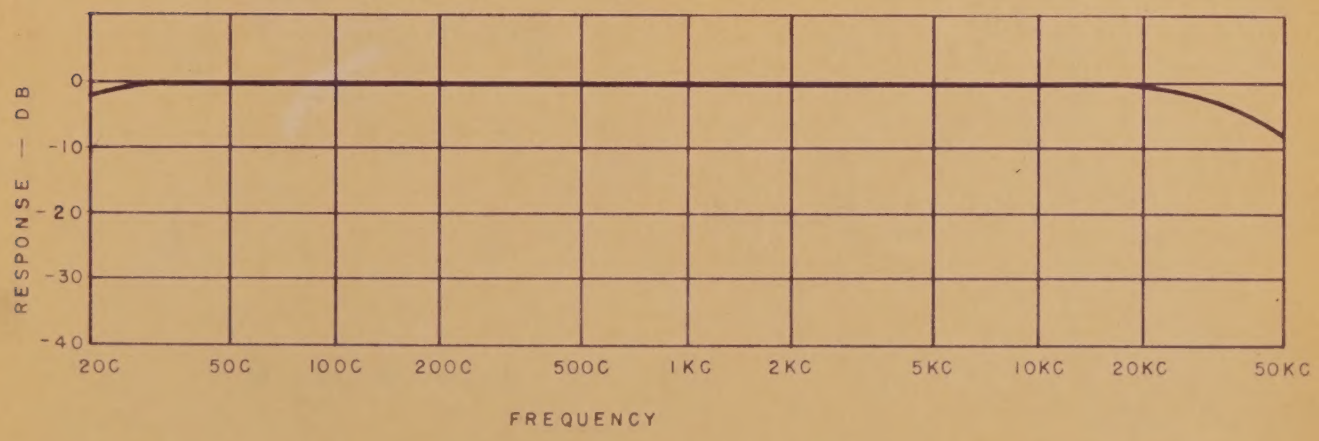
TUBES - THE FOLLOWING TUBES ARE REQUIRED AND SUPPLIED WITH THE INSTRUMENT:
2 - 6AU6, 1 - 6BA6, 1 12AU7, 1 - 6X4
1 - 0A2

TEMPERATURE AND HUMIDITY EFFECTS -
OVER THE NORMAL RANGE OF TEMPERATURE AND HUMIDITY VARIATION [65°F - 95°F, 0 - 95% RELATIVE HUMIDITY] THE ACCURACY IS SUBSTANTIALLY UNAFFECTED. AN EXCESSIVE CHANGE IN THE TEMPERATURE MAY NECESSITATE READJUSTMENT OF THE "SCALE ADJUST".

POWER SUPPLY - 105 TO 125 VOLTS, 50 TO 60 CYCLES. THE POWER CONSUMED IS 40 WATTS.

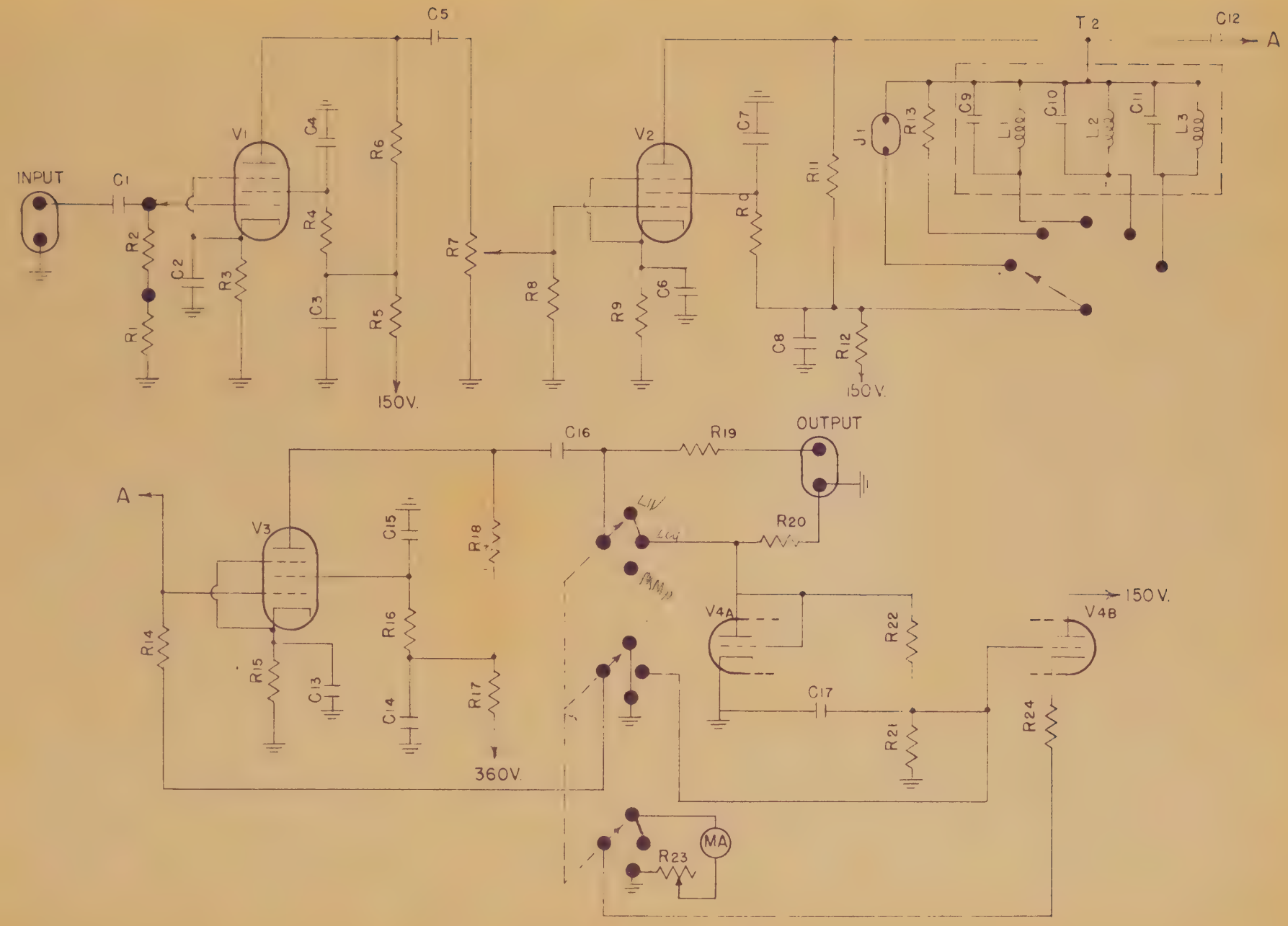
DIMENSIONS - 13 1/2" x 8 1/2" x 8 1/2"

WEIGHT - 22 LBS.

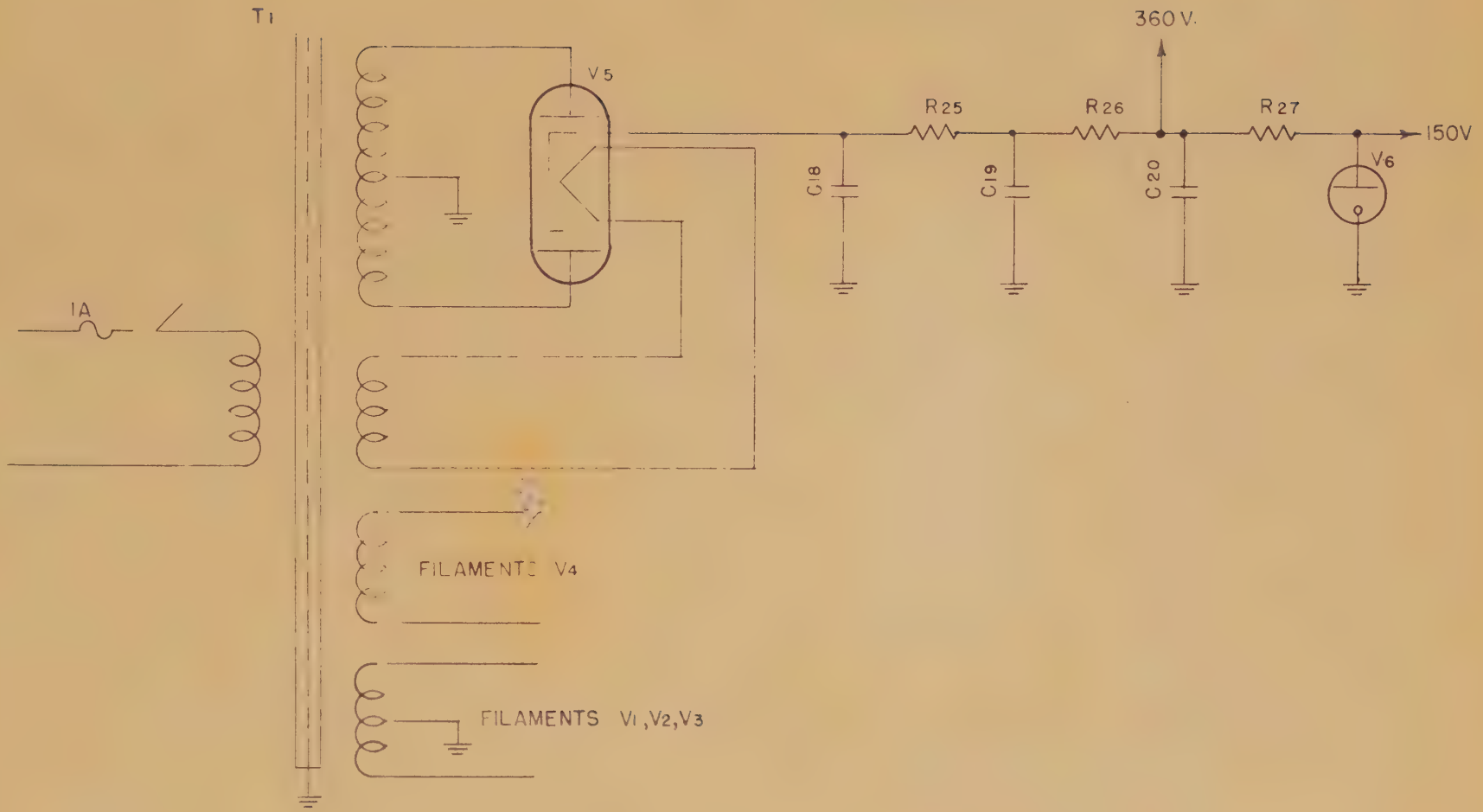


Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_07948



NULL DETECTOR AMPLIFIER



POWER SUPPLY

MODEL 1140-A NULL DETECTOR

PARTS LIST

RESISTORS

R-1	33K	1/2w	±10%
R-2	1 MEG	"	"
R-3	2.2K	"	"
R-4	220K	"	"
R-5	20K	"	"
R-6	27K	"	"
R-7	500K	2w	POTENTIOMETER
R-8	1 MEG	1/2w	±10%
R-9	220 OHMS	"	"
R-10	220K	"	"
R-11	470K	"	"
R-12	10K	"	"
R-13	27K	"	"
R-14	470K	"	"
R-15	680 OHMS	"	"
R-16	270K	"	"
R-17	10K	"	"
R-18	47K	"	"
R-19	27K	"	"
R-20	470K	"	"
R-21	220K	"	"
R-22	470K	"	"
R-23	5K	2w	POTENTIOMETER
R-24	7.5K	1/2w	±10%
R-25	200 OHMS	5w	±5%
R-26	800 OHMS	5w	±5%
R-27	10,000 OHMS	10w	±5%

CAPACITORS

C-1	.1 MFD	PAPER	200 VOLTS
C-2-3-4	20-20-20 MFD	ELECTROLYTIC	25-450-450 VOLTS
C-5	.1 MFD	PAPER	200 VOLTS
C-6	100 MFD	ELECTROLYTIC	50 VOLTS
C-7-8	10-10 MFD	ELECTROLYTIC	450 VOLTS
C-9-10-11	COMPONENTS OF FREED NO. 24653 FILTER		
C-12	.1 MFD	PAPER	200 VOLTS
C-13	100 MFD	ELECTROLYTIC	50 VOLTS
C-14-15	10-10 MFD	ELECTROLYTIC	450 VOLTS
C-16	.1 MFD	PAPER	400 VOLTS
C-17	.22 MFD	PAPER	200 VOLTS
C-18-19-20	10-15-15 MFD	ELECTROLYTIC	450 VOLTS

TRANSFORMERS

T-1	FREED # 24765 POWER TRANSFORMER
T-2	FREED # 24653 FILTER

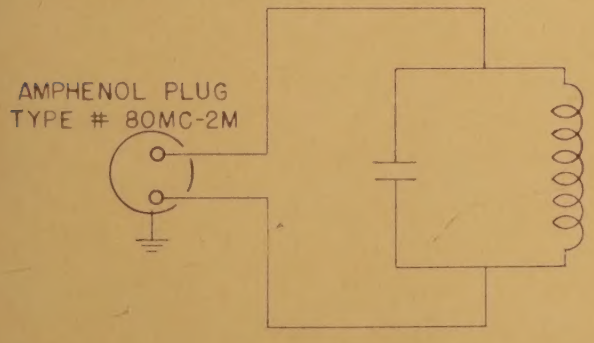
J-1	EXTERNAL FILTER JACK

TABLE OF VOLTAGE READINGS

TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1 6AU6	0	1.6	HEATER	HEATER	110	75	1.9		
V2 6AU6	0	.4	HEATER	HEATER	128	35	.4		
V3 6BA6	0	2.2	HEATER	HEATER	260	115	2.2		
V4 12AU7	.5	0	7	HEATER	HEATER	150	0	10	HEATER
V5 6X4	350A.C.					350A.C.	400		
V6 0A2	150	0			150				

ALL D.C. VOLTAGES MEASURED TO GROUND WITH 20,000 OHM/VOLT METER, GAIN AT MINIMUM AND INPUT TERMINALS SHORTED.

ALL A.C. VOLTAGES MEASURED TO GROUND WITH 1,000 OHM/VOLT METER.



EXT. FILTER
Z = 27K OHMS
FOR MAXIMUM EFFICIENCY

NOTE: WHEN EXTERNAL FILTER IS USED B+ IS BROUGHT OUT TO FILTER TERMINALS. (SEE SCHEMATIC)